

INPUT-OUTPUT UNIT

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an input-output unit comprising a liquid crystal display panel, EL, etc., (user interface unit) widely used with office automation machines such as copies, facsimiles, and printers and electronic machines such as personal computers, wordprocessors, handy terminals, and portable information communication machines.

2. Description of the Related Art

Known as a conventional input-output unit used for a control panel, etc., of an office automation machine such as a copier or facsimile or an electronic machine is a unit comprising an information input display of a liquid crystal display screen, etc., for displaying operation information of the machine and virtual operation buttons responsive to the operation information and enabling the operator to enter control information such as function selection or specification of the number of copies in the machine by pressing any of the virtual operation buttons.

Techniques related to such an input-output unit are already proposed, for example, as disclosed in Japanese Utility Model Laid-Open Nos. Sho 62-139025 and Hei 3-124542, Japanese Patent Laid-Open Nos. Hei 6-332602 and Sho 63-247819, etc.

Operation panel switches according to Japanese Utility Model Laid-Open No. Sho 62-139025 are operation panel switches for producing multiple display and are membrane switches having transparent electrodes placed on the top face of a dot matrix liquid crystal display device.

A switch mechanism using a liquid crystal display panel according to Japanese Utility Model Laid-Open No. Hei 3-124542 for controlling various functions of an electronic machine comprises a liquid crystal display panel for displaying symbols representing various functions of an electronic machine, a memory section for storing symbols displayed on a number of screens, a transparent pressure-sensing sensor being disposed on the front of the liquid crystal panel and switched to a function responsive to a displayed symbol group, an interface section for switching the function of the pressure-sensing sensor, and a backlight for illuminating the liquid crystal display panel from the rear.

Further, an information processing system according to Japanese Patent Laid-Open No. Hei 6-332602 comprises a liquid crystal display for displaying various pieces of information, a pressure-sensitive touch panel placed on the front of the liquid crystal display, a software keyboard being displayed on the liquid crystal display whenever necessary for receiving the coordinate position entered on the display from the pressure-sensitive touch panel, and a keyboard input auxiliary section being placed on or removed from the software keyboard and provided on the top face with projections like key buttons matched with the key layout of the software keyboard, characters matched with the key character layout of the software keyboard being displayed on the surfaces of the projections by printing, etc.

On the other hand, a touch panel input-output unit according to Japanese Patent Laid-Open No. Sho 63-247919 comprises a display unit having a display screen as a set of a large number of character areas and digital touch switches like a matrix superposed on the screen with the size of one partition area for sensing one coordinate position almost equaling the partition of the character area and the display

pitch of the character areas of the display unit almost equaling the detection pitch of the partition areas of the digital switches, wherein the partition areas of the digital switches are placed on the character areas of the display unit in offset overlapped relation of $\frac{1}{2}$ pitch in X and Y directions.

FIG. 24 is an exploded view to show a specific structure of a control panel of a conventional copier in various proposed techniques as described above. In such a conventional structure, an information input display consists of a translucent liquid crystal display screen 21 formed by bonding plate glasses and a touch panel 22 superposed on the display screen 21, and a panel board 24 having an opening 23 covers the information input display. The touch panel 22 is provided by forming a transparent conductive thin film matrix of ITO, etc., at predetermined pitches (for example, 4-mm pitches) on two glass substrates and then bonding the glass substrates with a slight gap between. When any position on the touch panel 22 is pressed, opposed conductive thin films are brought into local contact with each other by the press pressure, producing electric conduction. Then, a CPU circuit 25 determines the press position on the touch panel 22 based on a level change of an output signal. In FIG. 27, numeral 26 is a fluorescent lamp for illuminating the liquid crystal display screen 21 from behind, numeral 27 is a light diffusion board for diffusing illumination light of the fluorescent lamp 26 onto the full face of the liquid crystal display screen 21, and numeral 28 is an inverter circuit for turning on the fluorescent lamp 26.

In such a conventional information input display, if virtual operation buttons responsive to the available functions of the machine are displayed on the liquid crystal display screen 21 and the user is made to press the operation buttons, the user presses any of the operation buttons. Thus, whether or not one of the virtual operation button is pressed can be checked from the relationship between the press position on the touch panel 22 and the display position of the virtual operation button. Therefore, in a conventional control panel having the information input display, the display contents of the liquid crystal display screen 21 are changed for each use function, whereby more than one function can be assigned to one virtual operation button, so that the number of physical operation buttons provided on the control panel can be decreased markedly.

However, since the touch panel is placed on the front of the liquid crystal display screen in the conventional information input display, contrast of the display screen lowers and the display contents are hard to see. To consider easy-to-see display contents, the liquid crystal display screen is made translucent as described above and a backlight must be provided on the rear side of the display screen.

Since the touch panel and liquid crystal display screen use glass substrates, if the user strongly presses the touch panel in such a situation that the sensitivity of the touch panel worsens, it is also feared that the glass substrates may be broken under press pressure.

On the other hand, if operation buttons frequently used like ten digit keys for entering the number of copies are displayed as virtual operation buttons on the information input display, the appearance of the control panel is uncluttered, but it is feared that operability will worsen. Thus, as shown in FIG. 24, in the conventional control panel, operation buttons 29 such as ten-digit keys frequently used are provided separately from the information input display and of course, a switch matrix board 31 on which input switches 30 are placed is disposed below the operation